Overview of active methods for shielding spacecraft from energetic space radiation

L.W. Townsend
Department of Nuclear Engineering, The University of Tennessee, Knoxville, Tennessee 37996-2300 (USA)

Abstract

During the 1960's and into the early 1970's, investigations were conducted related to the feasibility of using active radiation shielding methods, such as afforded by electromagnetic fields, as alternatives to passive, bulk material shielding to attenuate space radiations. These active concepts fall into four categories: (1) electrostatic fields; (2) plasma shields; (3) confined magnetic fields; and (4) unconfined magnetic fields. In nearly all of these investigations, consideration was given only to shielding against protons or electrons, or both. During the 1980's and 1990's there were additional studies related to proton shielding and some new studies regarding the efficacy of using active methods to shield from the high energy heavy ion (HZE particle) component of the galactic cosmic ray spectrum. In this overview, each concept category is reviewed and its applicability and limitations for the various types of space radiations are described. Recommendations for future research on this topic are made.

KEYWORDS: Space radiation, Active shielding, HZE particles, solar particle events.

1st International Workshop on Space Radiation Research and
11th Annual NASA Space Radiation Health Investigators' Workshop
Arona (Italy), May 27-31, 2000

Physica Medica - Vol. XVII, Supplement 1, 2001